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$$H:R::R:R-h \text{ or } H=R\sqrt{2}.$$

Now by the law of gravitation, $(R\sqrt{2})^2:R^2::150:x$, the required weight, that is, $x=\dfrac{150R^2}{2R^2}=75$.

112. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in Irving College, Mechanicsburg, Pa.

Vary the radius of curvature of a plane curve inversely as the abscissa; then the solution will give you, (1) Ryan's Equation of the Elastic Curve, and (2) Wood's Equation of the Hydrostatic Curve.

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

$$\text{Radius of curvature}=\frac{\left[1+\left(\dfrac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\dfrac{d^2y}{dx^2}}=\frac{a^2}{2x}.$$

$\therefore a^2(d^2y/dx^2)=2x[1+(dy/dx)^2]^{\frac{3}{2}}$. Let $dy/dx=p$.

$\therefore a^2(dp/dx)=2x(1+p^2)^{\frac{3}{2}}$ or $a^2p/\sqrt{(1+p^2)}=(x^2+A)$.

$\therefore p=dy/dx=\pm\sqrt{(x^2+A)}/\sqrt{[a^4-(x^2+A)^2]}$. Let $x^2+A=a^2\cos\theta$.

$$\therefore y=\mp\tfrac{1}{2}a^2\int\frac{\cos\theta d\theta}{\sqrt{(a^2\cos\theta-A)}}=\mp\tfrac{1}{2}a^2\int\frac{(1-2\sin^2\frac{1}{2}\theta)d\theta}{\sqrt{(a^2+1-A-2\sin^2\frac{1}{2}\theta)}}.$$

Let $\frac{1}{2}\theta=\varphi$ and $2/(a^2+1-A)=e^2$.

$$\therefore y=\pm\frac{a^2e^2}{2}\int\frac{(1-2\sin^2\varphi)d\varphi}{\sqrt{(1-e^2\sin^2\varphi)}}.$$

$\therefore y=\pm a^2E(e,\ \varphi)\mp(\frac{1}{2}a^2)(2-e^2)F(e,\ \varphi)+B\ldots.(1)$.

Since $\varphi=\frac{1}{2}\theta$, $y=\pm a^2E(e,\ \frac{1}{2}\theta)\mp(\frac{1}{2}a^2)(2-e^2)F(e,\ \frac{1}{2}\theta)+B\ldots.(2)$.

(1) represents Ryan's Elastic Curve and (2) represents the Hydrostatic Curve. In the above $e<1$ and $A<a^2+1$.

In the second equation the curve can never cross the line of force since $\sin(\frac{1}{2}\theta)$ cannot equal $1/e$.

Also solved by *J. SCHEFFER*.

DIOPHANTINE ANALYSIS.

58. Proposed by JOHN M. COLAW, A. M., Monterey, Va.

Find a square proper fraction which if subtracted from unity will leave for remainder a square proper fraction.